followers, 'I suppose they will end some time, but I confess I see no reason why they should.'" Dr. Gilman concludes his article with the following wise words:—"In the conduct of a university, secure the ablest men as professors, regardless of all other qualifications excepting those of personal merit and adaptation to the chairs that are to be filled. Borrow if you cannot enlist. Give them freedom, give them auxiliaries, give them liberal support. Encourage them to come before the world of science and of letters with their publications. Bright students, soon to be men of distinction, will be their loyal followers, and the world will sing a loud Amen."

SCIENTIFIC SERIAL.

Memoirs of the Kazan Society of Naturalists, vol. xxxv.—Researches into the Protozoa of the Black Sea, by R. Minkiewicz. The organisation, the multiplication and the systematical position of Euplotes (Ehrbg.) are discussed.—Materials for the knowledge of the soil and vegetation of western Siberia, by A. Gordyaghin. This is the second and last part of a very valuable work which was began in a previous issue of the same periodical (vol. xxxiv.). The fir, Scotch fir and birch forests, the mutual relations between the chief arborescent species, and the Steppe vegetation are discussed in this part, which contains also a large-scale botanical map of the western portion of the basin of the Irtysh and a full index.—The physicochemical structure of the chlorophyll grain, by M. S. Tsvett. Experimental researches and critical review of the work hitherto done.—Botanic-geographical researches in the province of Saratov, by B. Keller. An interesting general review of the vegetation (summary in German) and a list of 987 plants belonging to the flora of Saratov are given.—On the soils of south-eastern Russia, by A. Ostriakoff, being descriptions and chemical analyses of salt-bearing soils of southern Samara.

SOCIETIES AND ACADEMIES.

LONDON.

Physical Society, May 9.—Prof. S. P. Thompson, president, in the chair.—Dr. P. E. Shaw exhibited a simple electric micrometer. Two years ago, Dr. Shaw described an instrument with which he measured very small lengths by the application of electric contacts, and the micrometer shown was a simple form of the original apparatus. A screw, fitted with a milled head, turns in a fixed nut, and its lower end presses upon the extremity of the long arm of a lever. A metal point is attached to the short arm, and the distance through which it moves, on turning the milled head, can be deduced from a knowledge of the pitch of the screw and the ratio between the arms of the lever. In using the instrument, this point is always brought up to a metal surface, and the contact is accurately determined by the telephonic arrangement described in connection with the original micrometer. Dr. Shaw illustrated the use of the instrument for measuring small lengths by describing the following eight applications to ordinary laboratory measurements:—(1) The measurement of the thickness of plates, films or fibres. The object is placed between two metal plates. The point of the micrometer is adjusted to touch the top plate and the reading taken. The object is removed, the point is again brought into contact with the top plate, and the difference between the readings in the two cases gives the thickness of the film. (2) The determination of Young's modulus by the elongation of a wire. Dr. Shaw described experiments on two wires, each 2½ metres long, hanging side by side, one of copper and the other of steel. The wires terminated in horizontal platforms to which the stretching weights were attached. The base of the instrument rested on one platform, while depressions of the other, due to loading, were measured. In this way any error, on account of the bending of the beam from which the wires were hung, was eliminated. (3) The determination of Young's modulus by the bending of a beam. (4) The determination of simple rigidity by a static method. Observations were made upon a rod held horizontally by rigid wall brackets. One end of the rod was fixed and the other held in position by a pin pressed into a hole in the end of the rod. From this end an arm projected outwards. Weights were applied to the extremity of this arm, and the twist measured by observing with the micrometer the movement of the end of the arm. (5) Application to the extensometer. (6) Measurement of thermal expansion. (7) Microscopic measurements. In measuring the diameter of a capillary tube, the cross wire of the microscope is made to touch one side of the tube, and the point of the micrometer is brought into contact with the metal stage. The stage is then moved by a screw until the cross wire comes to the other side of the tube. The micrometer point is moved into contact again, and the difference in the readings gives the diameter of the tube. In this measurement the full magnifying power of the microscope is utilised, and the work of moving the stage is performed by a rough screw. (8) The direct measurement of the wave-length of light. Newton's rings are formed by a convex lens and a piece of plate glass. The convex lens is fixed to the short arm of the lever, and the distance through which it must be moved to cause a certain number of bands to appear at the centre gives a means of calculating the wave-length of the light employed.—Papers on the conservation of entropy, by Mr. J. A. Erskine, and rational units of electromagnetism, by Sig. G. Giorgi, were postponed.

Chemical Society, April 30.—Prof. Emerson Reynolds, V.P.R.S., in the chair.—The preparation of absolute alcohol from strong spirit, by Dr. Young, F.R.S. The 4 or 5 per cent. of water remaining in the strongest rectified spirit procurable by distillation can be removed by adding to it a volatile liquid capable of forming with alcohol and water a ternary mixture boiling below 78°·3 C. and distilling. Benzene is a suitable substance for this purpose, the ternary mixture so formed boiling at 64°·85. The alcohol thus obtained contains a trace of benzene, which in turn can be removed by a redistillation with pure hexane.—On the properties of mixtures of the lower alcohols with water, by Dr. Young, F.R.S., and Miss E. C. Fortey. Methyl alcohol can be prepared in an absolute condition by simple distillation through an efficient still-head. The higher homologues, such as isopropyl, propyl and tertiary butyl alcohols, can be dehydrated by addition of benzene and redistillation. The constant boiling mixtures of these alcohols with water are not definite hydrates.—On the properties of mixtures of the lower alcohols with benzene and with benzene and water, by Dr. Young, F.R.S., and Miss E. C. Fortey. Among the lower alcohols of the paraffinic series, all except isoamyl alcohol form constant boiling mixtures with benzene, but beyond the amyl alcohols this phenomenon no longer occurs; ethyl, propyl, isopropyl and tertiary butyl alcohols alone form constant boiling ternary compounds with benzene and water.—Fractional distillation as a method of quantitative analysis, by Dr. Young, F.R.S., and Miss E. C. Fortey. When a mixture which tends to separate into two components is distilled, the portion of the distillate obtained below the temperature midway between the boiling points of the two constituents is almost exactly equal to the weight of the more volatile component of the mixture. This principle can also be extended to ternary mixtures.—On the vapour pressures and boiling points of mixed liquids, by Dr. Young, F.R.S. Mixtures of bromo- and chloro-benzene exhibit a close agreement with van der Waals's law, which states that "the relation between vapour pressure and molecular composition of mixtures of liquids having equal critical points and in which $a_{1\cdot 2} = \sqrt{a_1 a_2}$ (where $a_{1\cdot 2}$ represents attraction of unlike molecules and a_1 and a_2 the attractions of like molecules) is represented by a straight line."—The correction of the boiling points of liquids from observed to normal pressure, by Dr. Young, F.R.S. An extension and improvement of Craft's table of constants of correction.—Vapour pressures and specific volumes of isopropyl isobutyrate, by Dr. Young, F.R.S., and Miss E. C. Fortey. These constants have been determined on a pure specimen of this ester prepared by electrolysis of potassium isobutyrate.—The preparation of highly substituted nitroaminobenzenes, by Dr. Orton. The author has devised a method of preparing aromatic nitroamines by the action of nitric acid on amines dissolved in acetic anhydride, and has by this method isolated and characterised a number of these substances.—The atomic weight of tellurium, by Dr. Scott, F.R.S. When tellurium is treated with methyl iodide, it forms a trimethyl tellurium iodide which crystallises well and affords a convenient method of comparing the combining weight of tellurium with that of iodine which is accurately known from Stas's determination. The ratio thus found indicates that the atomic weight of tellurium is about 127·75.—Nitrogen bromides containing the propionyl group, by Dr. Chattaway. A continuation of the author's researches on nitrogen halides in which propionyl is a substituent. A number of these derivatives are described.

Mathematical Society, May 8.—Dr. E. W. Hobson, president, in the chair.—Dr. Ganesh Prasad read a paper on the use of Fourier's series in the theory of conduction of heat. It is pointed out that the received theory may break down through discontinuity in the initial conditions; and a method is described for forming an equation which shall, at the discontinuities, take the place of the usual partial differential equation of conduction. The modified theory thus deduced is equivalent to the ordinary theory at all places and times at which there is no discontinuity in initial or boundary conditions.—Mr. A. E. Western pointed out an exception to a theorem of Fermat's on binary powers.—Dr. F. S. Macaulay read a paper on some formulæ of elimination. The resultant of any number of equations, which are homogeneous in an equal number of variables, is proved to be expressible as the quotient of a certain determinant by a certain minor of the same; certain formulæ are also given connecting the determinants with the roots of the equations which, for this purpose, are made non-homogeneous by equating one variable to unity.—The following papers were communicated from the chair.—Prof. Burnside, on groups in which every two conjugate operations are permutable. The general character of the operations of a group which satisfy this condition of permutability is determined, and it is shown that the sufficient and necessary conditions that the group may be of finite order are that the generating operations are of finite order. In general for such a group, the commutator of any two operations is a self-conjugate operation. The case in which the order is a power of three is exceptional.—Mr. H. S. Carslaw, the application of contour integration to the solution of general problems in the conduction of heat and to the expansion of an arbitrary function in series. The solutions of certain special problems are transformed so that they are expressed in terms of integrals taken along certain paths in the plane of an auxiliary complex variable. The solutions of more general problems, built up by synthesis, are then transformed so that they are expressed by means of infinite series. The methods are applied to problems of conduction of heat in a finite rod and in a cylinder, and it is pointed out that they admit of extension to other branches of mathematical physics.

Geological Society, April 16.—Prof. Charles Lapworth, F.R.S., president, in the chair.—The Carlisle Earthquakes of July 9 and 11, 1901, by Dr. C. Davison. The shocks were at least four in number, and there are single records of four other shocks. The isoseismal 5 of the first and principal shock is very nearly a circle 29 miles in diameter, with its centre 7 miles south-south-west of Carlisle, and is excentric with regard to the isoseismal 4. The continuity of the shock over a band extending from Carlisle to Coniston implies a corresponding continuity in the focus. The investigation of the earthquakes has led to the recognition of a deep-seated fault, the average direction of which is N. 5° E. and S. 5° W. and the hade throughout is to the east. In the surface-rocks there is no sign whatever of such a structure. The movements along the fault were somewhat peculiar. In the first shock the focus was of considerable length, and consisted of two principal portions, the centres of which were about 23 miles apart, connected by a region wherein the slipping was continuous throughout, and much less in amount. The northern part of the focus was smaller than the other, but was marked by a much stronger impulse. The third slip was complementary to the first, for it appears to have occupied the whole of the region between the two principal portions of the first focus, and to have been greatest near the centre of that region and to have gradually diminished towards both ends.—The Inverness Earthquake of September 18, 1901, and its accessory shocks, by Dr. C. Davison. Since the Comrie earthquake of 1839, which was followed by 330 tremors and earth-sounds within little more than two years, no British earthquake has been attended by so many accessory shocks as this one. The unusual intensity of the earthquake, its apparent connection with the great northern boundary-fault of the Highlands, and the possibility of tracing oscillations in successive centres of disturbance along the fault-surface, combined in rendering a detailed investigation desirable. With a few exceptions, the earthquakes originated beneath the district lying between Inverness and the north-eastern end of Loch Ness. The mean direction of the fault, which follows the line of the Great Glen, is N. 35° E. and S. 35 W. and its hade is to the south-east. The isoseismal 8 contains 67 square miles, and its centre is about one-and-a-half miles east-north-east of Dochgarroch and three-quarters of a mile south-east of the fault-line. The correspondence between the position of the great boundary-fault and of the fault inferred from the seismic evidence is so close that there can be little doubt that the earthquake was due to a slip along this fault. The nature of the shock, the sound phenomena, time-relations and after-shocks are described in detail, and some account is added of the earthquakes of 1890 and of sympathetic earthquakes in the valley of the Findhorn. There were two distinct slips in rapid succession, with continuous slight motion between them, the second being greater in amount and extending over an area which probably overlapped, even if it did not entirely include, that within which the first took place. The great slip reached nearly from Loch Ness to Inverness, and was greatest at a point about half-way between. The three chief after-slips resulted in an extension of this area in both directions along the fault-surface, the extension to the north-east being small, while that to the south-west amounted to 6 miles or more. In addition to this migration of the focus, there was also a continuous decrease in the depth of the focus. The earthquakes provide no evidence with regard to the direction of displacement along the boundary-fault. There can be little doubt, however, that Loch Ness is still growing; but it can hardly be determined whether the lake is now contracting in area, or whether it is gradually pushing its way outward to the sea.—The Wood's Point Dyke, Victoria (Australia), by Mr. F. P. Mennell.

Zoological Society, May 6.—Prof. G. B. Howes, F.R.S., vice-president, in the chair.—A note was read by Mr. Roland Trimen, F.R.S., upon a moth of the genus Cossus, which had been reared in the Society's insect-house from a chrysalis sent home from South Africa. The specimen was apparently referable to the common goat-moth of Europe (*Cossus ligniperda*), which had probably been introduced in logs of wood into South Africa.—Mr. Oldfield Thomas, F.R.S., read a paper on the mammals obtained during the Whitaker Expedition to Tripoli. At Mr. J. I. S. Whitaker's expense, Mr. E. Dodson had made a successful collecting expedition into Tripoli, and the specimens of mammals obtained had been presented to the National Museum. Twenty-one species were referred to, and, among others, a hare (*Lepus whitakeri*), allied to *L. aethiopicus*, but of a bright pinkish buffy colour, and a gundi (*Ctenodactylus vali*) like *C. gundi*, but with much larger bullæ, were described as new.—A communication from Mr. G. A. Boulenger, F.R.S., contained lists of four species of fishes, eight species of batrachians and thirty-five species of reptiles, of which specimens had been collected by Mr. J. ffolliott Darling in Mashonaland. Amongst these were described as new two species of fishes (*Labeo darlingi* and *Barbus rhodesianus*), one of batrachians (*Rana darlingi*) and two of reptiles (*Homopus darlingi* and *Ichnotropis longipes*).—A communication was read from Hans Graf von Berlepsch and M. Jean Stolzmann containing a second part of their memoir on the ornithological researches of M. Jean Kalinowski in Central Peru. It gave an account of 188 species and subspecies, of which twelve were described as new.—A paper contributed by Sir Charles Eliot contained notes on the nudibranchs of the eastern and western coasts of Zanzibar. *Zatteria brownii*, *Dunga nodulosa* and *Crosslandia viridis* were described as new genera and species, and remarks were made upon the little-known species *Melibe fimbriata* and *Marrella ferruginosa*.—Prof. G. B. Howes, F.R.S., communicated a paper by Prof. G. Elliot Smith on a case of abnormal dentition in a lemur. The author recorded the occurrence in an individual of *Lemur fulvus* of a fourth lower molar, present on both sides, in its characters a diminutive counterpart of the normal third molar as regards its postero-external cusp. Reverting to the fact that certain fossil lemurs, marsupial-like, possess four molar teeth, and to the presence in Otocyon of four molars, and in the insectivore Centetes of a fourth upper molar, the author asserted a belief in a four-molared ancestry for the Primates.

PARIS.

Academy of Sciences, May 3.—M. Bouquet de la Grye in the chair.—The permanent secretary announced to the Academy the death of M. L. Fuchs, correspondant for the Section of Geometry.—Studies of batteries founded on the use of saline solutions with the reciprocal action of oxidising and reducing liquids, by M. Berthelot.—On the functions of the sphæridia of the sea-urchin, by M. Yves Delage. Various views have been put forward at different times as to the functions of the sphæridia in sea-urchins. An experimental study has been made with Echinocyamus, and it was found that the sphæridia are not the exclusive organs of the sensation of orientation, since sea-urchins deprived of these organs can turn over as certainly, although less rapidly, than before.—On a class of transformations of Buckland, by M. E. Goursat.—On the deformation of conoids, by M. A. Demoulin.—The problem of surfaces loaded on end. Solution in the case of the cylinder of revolution, by M. Alban Gros.—On the function of self-induction in electric discharges through gases, by M. B. Eginitis.—The action of an intense magnetic field upon the anodic flux, by M. H. Pellat.—The action of self-induction on the spectrum of dissociation of compounds, by M. A. de Gramont. It was found that by altering the self-induction of the spark circuit the spectrum of air could be very easily eliminated without altering that of other bodies. By still further increasing the self-induction of the circuit, the lines due to various metalloids, such as sulphur, selenium, tellurium and phosphorus, could be made to disappear, a result which has obvious applications in the spectroscopic analysis of minerals.—On the law of Maxwell $n^2 = K$ for some compounds containing nitrogen, by M. Edm. van Aubel (see p. 68).—Glucose and the carbonates of cerium. On a new mechanism of oxidation, by M. Andre Job. Cerous carbonate in the presence of air is capable of oxidising arsenites and also glucose. In the latter case the cerous salt behaves like an oxydase.—On the alloys of cadmium with barium and calcium, by M. Henri Gautier.—On an oxycarbide of cerium, by M. Jean Sterba. By the action of carbon upon cerium oxide in the electric furnace, a well-defined crystallised oxycarbide can be obtained of the formula $CeC_2.2CeO_2$. This oxycarbide is relatively stable in water and air, and when decomposed with dilute acids furnishes unsaturated hydrocarbons. No other carbides except this and cerium carbide, CeC_2, can be obtained in the electric furnace.—On arsenic anhydride and its hydrates, by M. V. Auger. The only hydrates which could be obtained were $(H_3AsO_4)_2$, H_2O and $H_6As_4O_{13}$. The three hydrates $HAsO_3$, $H_4As_2O_7$ and H_3AsO_4 described by Kopp could not be prepared.—The preparation and properties of the chloro-, bromo- and iodo-sulphobismuthites of lead, by M. Fernand Ducatte.—On some derivatives of pyruvylpyruvic ester, by M. L. J. Simon. An unsuccessful attempt was made to prepare this ester, $CH_3—CO—CO—CH_2—CO—CO_2C_2H_5$. The product of the action of aniline upon ethyl pyruvate appears to be this triketone condensed with two molecules of aniline. Only one of the aniline groups could be split off by hydrolysis with sulphuric acid.—On the mutual action of acid chlorides and methanal, by M. Marcel Descudé.—On the combinations of sodium tetrazoditolylsulphite with aromatic amines and phenols, and their transformation into azo colouring matters, by MM. A. Seyewetz and Biot.—On the addition of hypochlorous acid to propylene, by M. Louis Henry. A reply to a note of M. Tiffenau on the constitution of the chlorhydrins. The constitution of the addition product of hypochlorous acid to propylene has usually been determined by oxidation. The author points out that the apparently contradictory results obtained are due to the fact that the same compound gives different oxidation products according to the oxidising agent used. It is possible that two addition products are simultaneously formed, but the principal one is undoubtedly that in which the $-OH$ group attaches itself to the group $=CH_2$.—The development of black rot, by M. A. Prunet.—The Carboniferous eruptive rocks of Creuse, by M. L. de Launay. The results of this investigation are in accord with the theory of M. Michel Lévy on the differentiation of magmas.—Study of specimens of water and sea floor from the North Atlantic, by M. J. Thoulet.

DIARY OF SOCIETIES.

THURSDAY, May 15.

Royal Society, at 4.30.—On some Phenomena affecting the Transmission of Electric Waves over the Surface of the Sea and Earth: Capt. H. B. Jackson, R.N., F.R.S.—Microscopic Effects of Stress on Platinum: T. Andrews, F.R.S., and C. R. Andrews.—A Note on the Recrystallisation of Platinum: W. Rosenhain.—Cyanogenesis in Plants. Part II. The Great Millet, *Sorghum vulgare*: Prof. W. R. Dunstan, F.R.S., and Dr. T. A. Henry.—On Electro-motive Wave accompanying Mechanical Disturbance in Metal immersed in Electrolyte: Prof. J. C. Bose.

Institution of Electrical Engineers (Society of Arts), at 8.—Electrical Traction on Steam Railways in Italy: Prof. C. A. Carus-Wilson.

Chemical Society, at 8.—The Radioactivity of Thorium Compounds. II. The Cause and Nature of Radioactivity: E. Rutherford and F. Soddy.—The Radioactivity of Uranium: F. Soddy.—The Variation with Temperature of the Surface Tensions and Densities of Liquid Oxygen, Nitrogen, Argon and Carbon Monoxide: E. C. C. Baly and F. G. Donnan.—Comparison of Bromonitrocamphane with Bromonitrocamphor: M. O. Forster.—*aa*-Benzoylnitrocamphor and *aa*-Benzoyliodocamphor: M. O. Forster and E. A. Jenkinson.

FRIDAY, May 16.

Royal Institution, at 9.—The Nebular Theory: Sir Robert Ball, F.R.S.

TUESDAY, May 20.

Royal Institution, at 3.—The Laws of Heredity with Special Reference to Man: Prof. Karl Pearson, F.R.S.

WEDNESDAY, May 21.

Royal Microscopical Society, at 7.30.—Exhibition of Freshwater Entomostraca: D. J. Scourfield.

Royal Meteorological Society, at 4.30.—Report on the Wind Force Experiments on H.M.S. *Worcester* and at Stoneness Lighthouse: W. H. Dines and Capt. D. Wilson-Barker.—The Cornish Dust Fall of January, 1902: Dr. H. R. Mill.

THURSDAY, May 22.

Institution of Electrical Engineers (Society of Arts), at 8.—Annual General Meeting.

FRIDAY, May 23.

Royal Institution, at 9.—The Ethical Element in Shakespeare: Rev. Canon Ainger.

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